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Complete Specification entitled (54) SCREWS HAVING ROUNDED HEADS AND TOOL FOR HANDLING SAME.

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Related Art (56)

110,175(1180/39)	78.3; 80.3; 72.1.
6746/66	78.3; 72.1; 80.3.

The following statement is a full description of this invention, including the best method of performing it known to us :

W. C. Money, Government Printer, Canberra

1962/71—A
X423-97-2D-21P. C.

This invention relates to screws with heads devoid of a nick, nicks, or recesses or other means engageable by a conventional screwdriver, Furthermore, the invention relates to means for the manipulation or handling of such screws, i.e. for screwing same into a screw-hole or, if the screws are self-tapping, for driving same into a receiving body, and for unscrewing or removing such screws therefrom.

More specifically this invention is concerned with screws which have a head of oval contour, a cylindrical, substantially cylindrical or truncated-cone-shaped circumferential side and a rounded top. The underside of the screw head may be plane, or it may be shaped otherwise, e.g. truncated-cone-shaped to fit into a bevelled or countersunk screw-hole. In the following description and in the appended claims any such screw-head will be referred to briefly as a "rounded screw-head".

The object of the present invention is to provide a novel type of screw having a rounded screw-head as defined above, and a tool suitable for the effective handling thereof, i.e. for fastening same in, and more particularly, for unfastening and removing it from a pre-formed or self-tapped screw-hole, without relying on a nick, nicks (e.g. crossed nicks) or equivalent on the screw-head, and without relying on an edge tool adapted to enter such a nick, nicks, recess or the like.

According to this invention the contour of the rounded screw-head - viewed in the direction of the screw-shank - is oval. The tool according to the invention for the fastening and unfastening of screws having such rounded screw-heads includes a spanner-like socket which may be mounted on, or provided with a handle, the socket having a cavity the contour of which somewhat exceeds that of the head contour in size, all around the circumference of the latter, the smallest inner diameter of said cavity being smaller than the largest diameter of the head.

When properly placed on an oval ~~a rounded~~ screw-head - e.g. for unscrewing a screw - the inner wall of the tool socket will surround the head with some clearance, and if then turned around the axis of the screw through an angle - mostly a small angle -, the socket will reach a position in which its inner wall, which bounds the cavity therein, will engage, and will finally get a grip on, the rounded screw-head.

Taking as an example a screw-head according to the invention, the contour of which is elliptical with major and minor axes the lengths of which is $2\underline{a}$ and $2\underline{b}$, respectively, and a tool according to the invention the operative cavity of which is likewise elliptical, the lengths of the major and minor axes of said cavity being $2\underline{A}$ and $2\underline{B}$, respectively, the conditions for the operability are as follows:

1) $A > a$ and $B > b$ which, expressed in words, means to say that there must be ~~positions of the elliptical~~ screw-head within the elliptical cavity of the tool in which there is a clearance between the outer contour

of the head and the inner contour of the socket;

2) a > B which, expressed in words, means that the major axis 2a of the elliptical screw-head cannot assume a position inside the elliptical contour of said cavity, parallel to the minor axis 2B of the latter. This condition thus ensures that there are two alternative positions of the screw-head within the contour of the socket in which there is positive engagement of the socket with the circumference of the screw-head and, consequently, adequate grip of the socket on said head.

Condition 1) implies that, depending on the actual magnitudes of a, b and A, B, a single tool socket can serve for the handling of screws having rounded screw-heads of different sizes.

Similar considerations apply to rounded screw-heads of oval contour, although the conditions of operability of the tool socket cannot be expressed mathematically in equally precise terms, as the word "oval" is not capable of a geometrical definition as precise as that of "elliptical". The expert, however, will encounter no difficulty in practically determining the socket size and/or contour suitable for the handling of each rounded screw-head of given dimensions.

It will be understood that the tool-socket according to the invention can be used with advantage also on oval ~~screw-heads having a nick or nicks~~.

The tool according to the invention may have the socket made of steel, with at least the cavity wall being

hardened. The tool socket, the axial depth of which is optional, can be made in one with, or be rigidly connected - e.g. by welding - to a stem rigidly secured to a wooden or other hand-piece, the assembly resembling in appearance a screwdriver, spanner, or other hand-tool.

If so desired, the tool socket may be magnetised to facilitate the picking-up of screws by their heads.

In the following the invention is described in more detail with reference to the accompanying drawings which illustrate, by way of example only, some embodiments of the invention and - diagrammatically - the principle on which the invention is based. In these drawings:-

Fig. 1 shows in perspective view a wood-screw having a rounded screw-head together with a handling tool according to the invention;

Fig. 2 shows, on a larger scale, the socket of the tool

of Fig. 1 in longitudinal section, and a screw with its rounded head inside the cavity of the socket;

Fig. 3 is an end view of the socket of Fig. 2 and of the screw therein, partly in section;

Fig. 4 is a diagram illustrating the geometry basic to the invention for elliptical contours of a rounded screw-head, and of the inner wall of the cavity in the socket of a tool for handling same;

Figs. 5 and 6 are views similar to Figs. 2 and 3, respectively, illustrating the socket of a differently designed tool for the purpose set forth, and another type of screw the head of which is oval; and Figs. 7 and 8 illustrate the tool shown in Fig. 5 in perspective view and in plan view, respectively.

The handling tool shown in Figs. 1, 2 and 3 has as the operative element a socket 10 made of steel which is provided in its flat end 11 with a cavity 12. The opposite end 13 of the socket 10 is closed and terminates in a stem 14 which is rigidly secured in a hand-piece 15 made, e.g. of wood or plastic material.

The cavity 12 in the outer end of the socket and bounded by the inner wall 16, is of round but non-circular cross-section. It is so dimensioned that it can accommodate with adequate clearance from the wall 16, a screw-head 19 for the handling (screwing or unscrewing) of which it is intended, the only limitation - in this respect - being that the largest diameter of the cavity 12 must exceed, and its smallest diameter must be smaller than, the largest diameter of the screw-head, as follows from the abovementioned conditions 1) and 2), and will be explained below for elliptical contours with

reference to Fig. 4 of the drawings. The depth "d" of the cavity 12 should correspond at least substantially to the height of the screw-heads to be handled; preferably, however, it is larger, e.g. as shown in Fig. 2.

The tool shown in Fig. 1 is suitable for the fastening and unfastening of a screw such as shown for instance at 17, which has a threaded shank 18 and a rounded screw-head 19. When placing the tool on a screw-head to be acted upon, the clearance between the inner wall of the cavity 12 and the circumference of the screw-head may vary, there being no difficulty whatsoever to the operator in placing the tool in position on the screw-head, as the socket will receive the screw-head in most relative positions, except over a comparatively small angular range. Once the screw-head 19 has entered the cavity the operator will rapidly find either the one or the other of the two positions of the socket - operative for a right-handed and a left-handed screw, respectively - in which it grips the screw-head for either fastening or unfastening the screw.

Fig. 4 illustrates diagrammatically the geometry which is basic to the invention as applied, for instance, to the embodiment described with reference to Figs. 2 and 3, the assumption being that the contour of the screw-head 19 and the circumference of the inner wall 16 of the cavity 12 are both precisely elliptical. The screw-head is represented by a heavy, full-line ellipse E_H and the inner wall 16 of the cavity by a dash-and-dot line ellipse E_S.

In the figure the screw-head is shown to be placed centrally and symmetrically into the cavity, although it could initially be in any position whatsoever within the cavity, as long as there is a continuous clearance between

the two ellipses E_H and E_S.

The figure also shows in thinner full lines the ellipses E_H' and E_H'' representing the two - alternative - positions of the screw-head 19, in which the wall 16 "grips" the circumference of the screw-head for either fastening or unfastening the screw.

The axes 2A and 2B of the ellipse E_S and axes 2a and 2b of the ellipse E_H are likewise indicated in Fig. 4. It can clearly be seen from the figure that $A > B$, and that $a > b$.

Fig. 4 further shows in dotted lines an ellipse E_O with its major axis 2a' making an angle of 90° with the major axis 2a of E_H, its position coinciding with that of the minor axis 2B of the ellipse E_S representing the inner wall 16 of the cavity 12. It is obvious therefrom that an elliptical screw-head the size of which equals that of the ellipse E_O would not be operatively engaged by the cavity wall 16 in any angular position at all. This illustrates the correctness of the above mentioned condition 2) of operability, viz. $a > B$.

Figs. 5 and 6 illustrate another embodiment of the invention. This differs from the first described embodiment in the following details: The contour of the screw-head 119 is oval, instead of elliptical and its circumference is slightly tapered instead of being precisely cylindrical.

The type of threading 120 provided on the screw shank is shown to be different from that shown in Figs. 1 and 2. This is not an essential feature of the invention and serves only the purpose of illustrating that the invention is applicable to any type of screw, provided it has a rounded

screw-head according to the invention.

The handling tool has a socket with an aperture or cavity 112 which in the example shown is elliptical, the major axis 2A of the ellipse being larger than the greatest width of the screw-head 119 which in Fig. 6 is indicated by "D". The figure further reveals that the size and shape of the screw 119 is such that it can be placed in the aperture 112 with clearance all around its circumference and, finally, that the minor axis 2B of the elliptical aperture is smaller than the greatest width of the screw-head. These relations correspond to those laid down in conditions 1) and 2) for the operability of the arrangement.

The elliptical aperture 112 could also be replaced by an aperture, or cavity, of different circumferential configuration, e.g. oval ~~or otherwise~~, as long as the conditions laid down in the preceding paragraph of this specification are complied with.

As far as the oval contour of the screw-head is concerned, that depicted in Fig. 6 is only one of an infinite number of possible oval configurations.

Fig. 5 further shows that the circumferential surface of the rounded screw-head need not necessarily be cylindrical as is shown in Fig. 2, but may e.g. be slightly tapered, and even slightly curved (not shown), if so desired.

As distinct from the embodiment according to Figs. 1 to 3, the handling tool 122 is here designed like a spanner with a socket 110 having the through aperture 112 extending between the ends thereof, and with a handle 114 which extends radially therefrom in the manner shown in Figs. 7 and 8.

It is to be observed however, that also in this case a

cribed with reference to Figs. 1 to 3 could be used.

We desire to be understood that we do not wish protection by Letters Patent to be limited to the details above described, and as illustrated in the drawings, as further modifications of the rounded screw-head and/or of the handling tool are feasible within the scope of the appended claims.

Particular attention is directed to the fact that the width of the clearance between the circumference of a rounded screw-head and the inner wall of the operative part or socket of the handling tool, can be much smaller than that shown e.g. in Figs. 2,3,4 and in Figs. 5 and 6 of the accompanying drawings.

It will be understood that especially Figs. 4 and 6 are, primarily, explanatory drawings in which a wide clearance is necessary for showing the difference between an inoperative and the operative positions of the handling tool relative to a screw-head.

While the proportions shown in the drawings are feasible, the average width of this clearance is in many cases less than 10%, and even less than 3 to 5% of the average diameter of a screw-head, it being only necessary for the difference between the size of a screw-head and that of the operative part of the handling tool to be such, that the latter can be placed on the screw-head conveniently, and without difficulty.

The Claims defining the invention are as follows:-

1. A screw having a head of oval contour; a cylindrical circumferential side and a substantially cylindrical or truncated-cone-shaped rounded top.

2. A screw as claimed in Claim 1, the screw head being devoid of a nick, groove, incision or equivalent in its top surface.

3. For the handling (screwing and unscrewing) of a screw having a screw-head as claimed in Claim 1 or Claim 2, a hand-tool having an operative part or socket and a handle, said operative part or socket being provided with a cavity the contour of which is oval and the size of which exceeds that of the respective screw-head, the smallest diameter of said cavity being smaller then the largest diameter of said screw-head.

4. A hand-tool as claimed in Claim 3, wherein the operative part or socket thereof is made in one piece, or rigidly connected with a stem and the stem is rigidly secured to a hand-piece, the hand-tool resembling in appearance a conventional screw driver.

5. A hand-tool as claimed in Claim 4, wherein said hand-piece is made of wood or of a synthetic plastic material.

6. A hand-tool as claimed in Claim 3, wherein the cavity provided in the operative part or socket thereof is constituted by a through aperture, and the handle extends radially from said operative part or socket, the hand-tool resembling in appearance a convention spanner.

7. A hand-tool as claimed in any one of Claims 3 to 6, the operative part or socket of which is made of steel and is hardened.

8. A hand-tool as claimed in any one of Claims 3 to 7, the operative part or socket of which is magnetised.

9. A ~~rounded~~ screw-~~head~~ substantially as illustrated in Figs. 1,2 or Figs. 5 and 6 of the accompanying drawings, and as hereinbefore described with reference thereto.

10. For the handling (screwing and unscrewing) of a screw having a rounded screw-head as claimed in any one of Claims 1,2 and 8, a hand-tool substantially as illustrated in Figs. 1 to 3 or in Figs. 5,7 and 8 of the accompanying drawings, and as hereinbefore described with reference thereto.

DATED this 23rd day of March, 1971

AUSTRALIAN SCREW CO. PTY. LIMITED

Patent Attorneys for the Applicant:

F.B. RICE & CO.

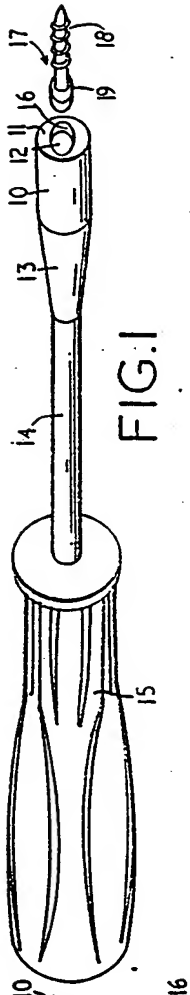

FIG.1

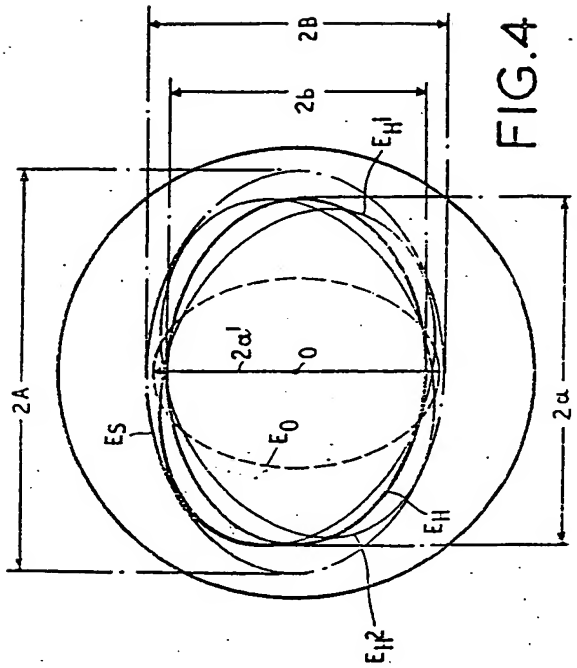

FIG.4

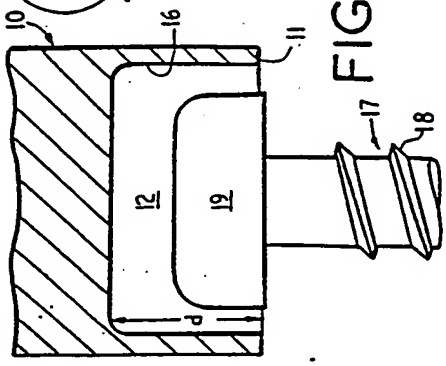

FIG.2

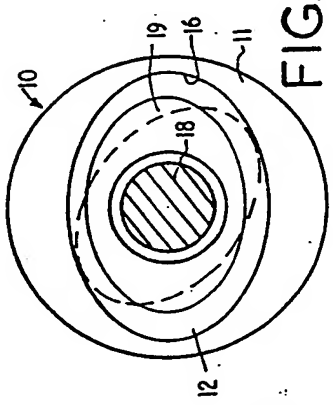

FIG.3

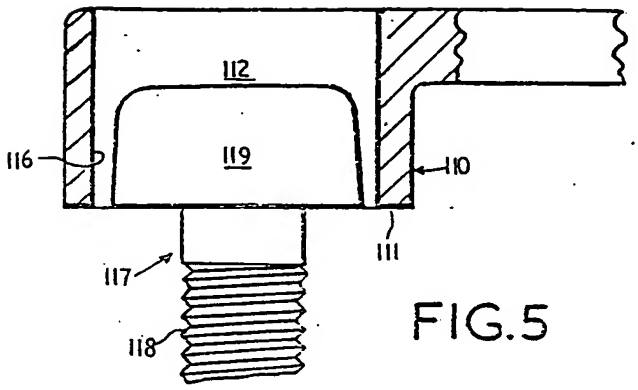

FIG.5

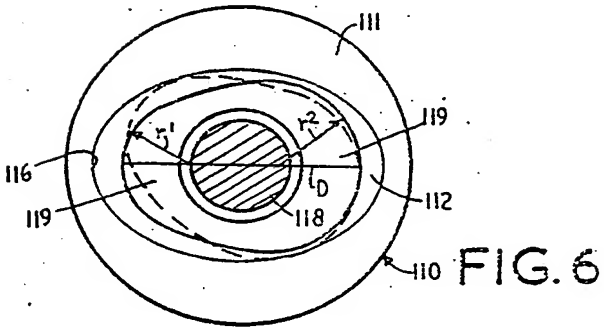

FIG.6

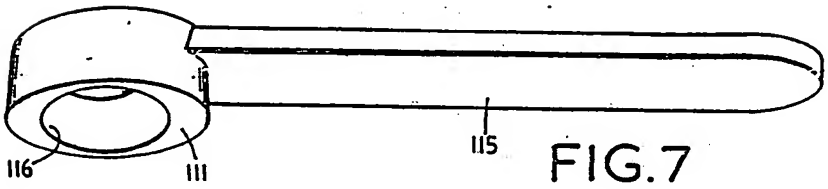

FIG.7

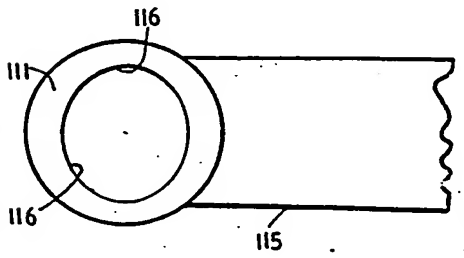

FIG.8